

What is claimed is:

1. Ejection apparatus (103) for separating a molded part from a molding surface (202) of a mold cavity (122) defined by a pair of cooperating mold members (118, 120) in a mold assembly of an injection molding machine (99), the mold assembly including at least one ejector pin (200) mounted in an ejector pin carrier (216) for movement relative to the molding surface (202), wherein the ejection apparatus comprises:

an electrically-powered ejector drive system for moving the ejector pin carrier (216) relative to the molding surface (202), the drive system including an electric motor (240) having a rotatable output shaft (241), and a cam member (252) connected with the motor output shaft (241), a cam follower (260) operatively coupled with the ejector pin carrier (216), such that the cam follower (260) interacts with the cam member (252) to convert rotation of motor drive shaft (241) to linear movement of the ejector pin carrier (216) relative to the molding surface (202) when the motor (240) is rotated in only one direction of rotation.

2. Ejection apparatus in accordance with claim 1, wherein the ejector pin carrier includes an ejector plate (216) movable toward and away from the molding surface (202).

3. Ejection apparatus in accordance with claim 2, wherein the ejector pin (200a) is slidably carried by the ejector plate (216).

4. Ejection apparatus in accordance with claim 3, wherein the ejector pin (200a) includes an enlarged end stop member (208) at its inner end to limit outward travel of the ejector pin (200a) relative to the ejector plate (216).

5. Ejection apparatus in accordance with claim 4, wherein the ejector pin (200a) includes an intermediate, outwardly-extending flange (210), and a compression spring (212) positioned between the flange (210) and the ejector plate (216) for biasing the ejector pin (200a) into an extended position relative to the ejector plate (216).

6. Ejection apparatus in accordance with claim 2, further comprising an ejector rod (222) extending from the ejector plate (216) and slidably supported in a movable platen (116) that carries one of the mold members (118).

7. Ejection apparatus in accordance with claim 6, wherein the ejector rod (222) connects to a knock-out bar (230) that is operatively coupled to the cam follower (260) of the

ejector drive system.

8. Ejection apparatus in accordance with claim 7, wherein the ejector rod (222) is slidably carried by the knock-out bar (230) for limited relative movement, and a spring (234) is positioned between an end (232) of the ejector rod (222) and the knock-out bar (230) for spring biasing the knock-out bar (230) in a direction toward the mold member (118).

9. Ejection apparatus in accordance with claim 1, wherein the cam member (252) includes a substantially circular cam track (254).

10. Ejection apparatus in accordance with claim 9, wherein the cam track (254) is offset from an axis of a drive shaft (250) that rotates the cam member (252), so that the cam follower (260) moves linearly in a direction toward and away from the surface (202).

11. Ejection apparatus in accordance with claim 10, wherein the cam member (252) includes means for adjusting the relative offset of the cam track (254) to the axis of the drive shaft (250).

12. Ejection apparatus in accordance with claim 11, wherein the means for adjusting the relative offset of the cam track (254) comprises discrete alternate mounting locations for the drive shaft (250) in the cam member (252).

13. Ejection apparatus in accordance with claim 11, wherein the means for adjusting the relative offset of the cam track (254) comprises means for variably displacing the location of the drive shaft (250) relative to a central axis of the cam member (252).

14. Ejection apparatus in accordance with claim 13, wherein the means for variably displacing the location of the drive shaft (250) relative to a central axis of the cam member (252) comprises a bearing block (270) to receive the drive shaft (250) and means for adjusting the mounting position of the bearing block (270) in the cam member (252).

15. Ejection apparatus in accordance with claim 9, wherein the cam track (254) of the cam member (252) includes at least one portion (280) that varies from the substantially circular path of the cam track (254) to generate a pulsation in the linear movement of the ejector pin carrier (216) when the cam member (252) is rotated.

16. Ejection apparatus in accordance with claim 1, wherein the motor (240) drives a first drive pulley (242) that includes a first one-way clutch operatively coupled with the ejector drive system for moving the ejector pin (200) toward and away from the molding surface (202) while the motor (240) rotates in only one direction of rotation.

17. Ejection apparatus in accordance with claim 16, wherein the motor (240) also drives a second drive pulley (264) that includes a second one-way clutch operatively coupled with a second drive system of the injection molding machine (99), such that the second drive system operates only when the motor (240) rotates in a direction opposite from
5 that for operating the ejector drive system.